FloodSAFE CALIFORNIA

Economic Analysis Procedures

for Integrated Flood Risk Management Studies

Risk and Economics Analysis Session

Technical Workshop #2:

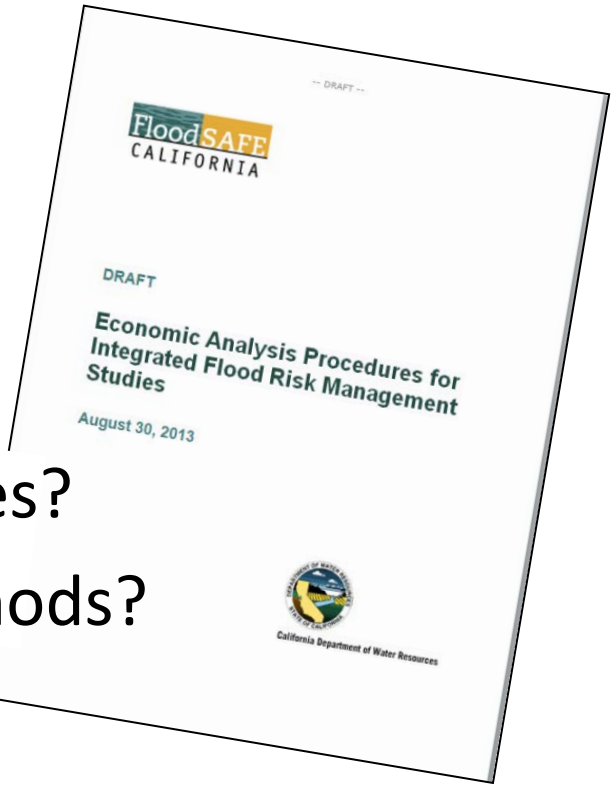
Tools and Data for Measuring Progress Toward Achieving the Basin-Wide Feasibility Studies and Central Valley Flood System Conservation Strategy Objectives

October 24, 2013

PUBLIC SAFETY ENVIRONMENTAL STEWARDSHIP ECONOMIC STABILITY

EAP – a tool box

- What is an economic analysis?
- Context for EAP
- What is EAP?
- What are the EAP objectives?
- Metrics described in EAP
- What are the EAP benefit categories?
- What are the EAP net benefit methods?
- Monetizing ER benefits (example)
- Example of combining benefits



What is an Economic Analysis?

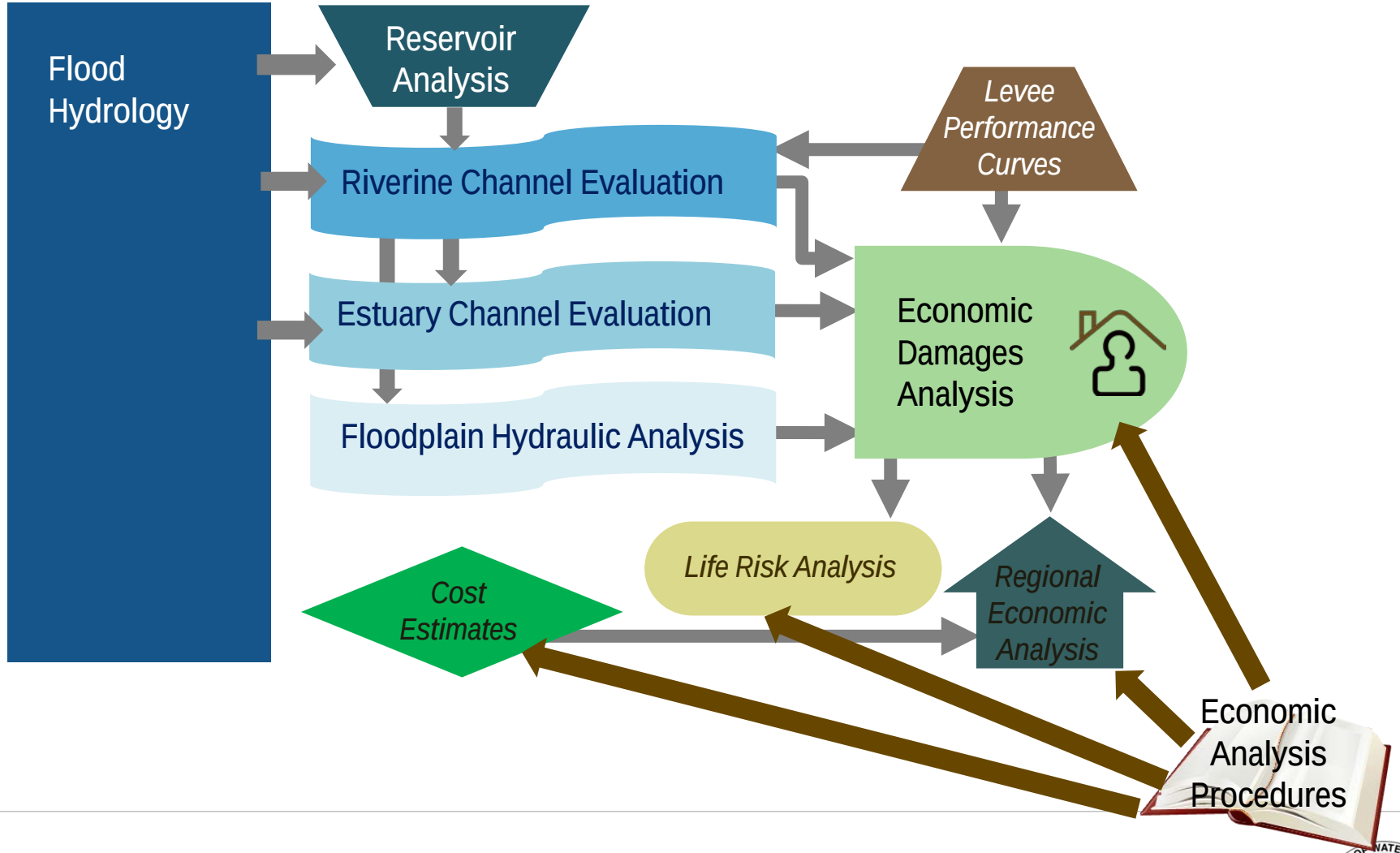
- The objective is to determine if one alternative project represents the best use of resources over analysis period
- A critical element in the planning process
- A tool helping answer questions like:

Should the project be built at all?

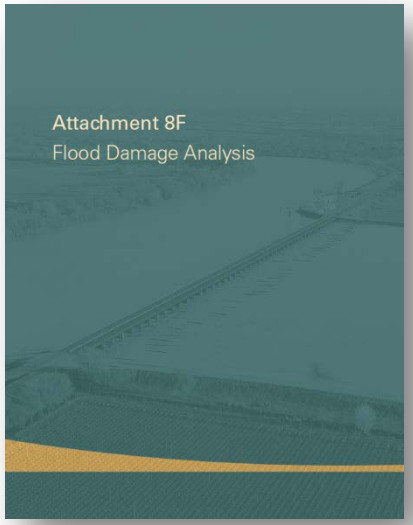
Will the project have a net positive social value for Californians?

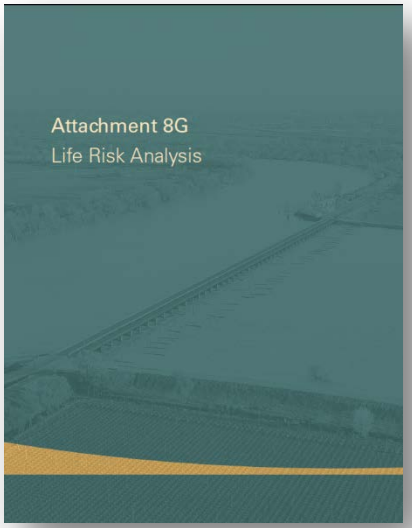
Should it be built to a different configuration or size?

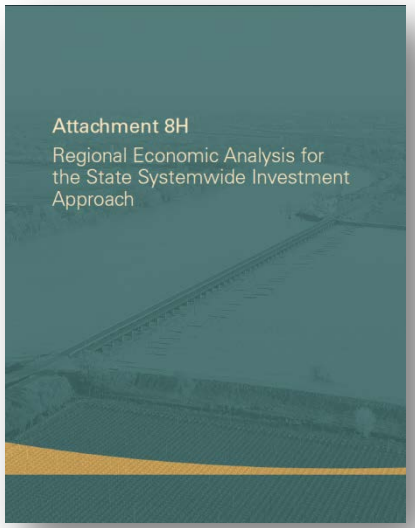
Flood Management Systemwide Analysis Tools & Data

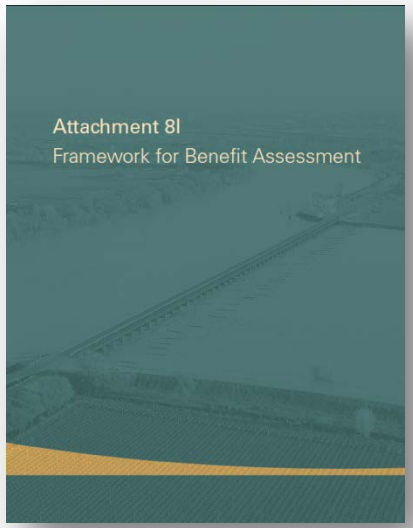


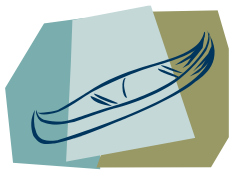
2012 CVFPP Economic Analyses











What is EAP?

EAP as a tool for water management:

- EAP is a tool in the boarder IWM tool box to analyze benefits and costs of proposed water management actions
- Designed for DWR users
- Expands upon and refines previous guidelines

What are the objectives of EAP?

- Describe:
  - Benefit assessment method for each benefit category
  - Major steps for each benefit category's assessment method
  - Data requirements and sources
  - Analysis software applications
  - Methods to combine monetary and nonmonetary effects
- Provide: Analysis results display templates
- Discuss: Caveats and limitations of tools

Metrics described in EAP

1. People and Property at Risk
1a. Urban Flood Protection 2) Risk to human life, health, and safety (%) 3) Damage to property & infrastructure ($)
1b. Small Community Flood Risk Reduction 2) Risk to human life, health, and safety (%) 3) Economic damages ($)
1c. Rural-agricultural Area Flood Risk Reduction 2) Risk to human life, health, and safety (%) 3) Damage to property, crops, & infrastructure ($)
15. Integrated Water Management
15a. Multi-benefit Projects 1) Project funding allocated to different purposes (flood management, ecosystem functions, water supply, etc) ($ and % of total funding)

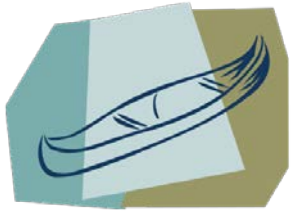
What are the EAP benefit categories?

Flood risk management*

Ecosystem restoration

Water supply and water quality*

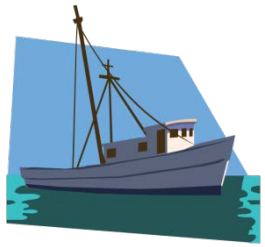
Recreation and open space*



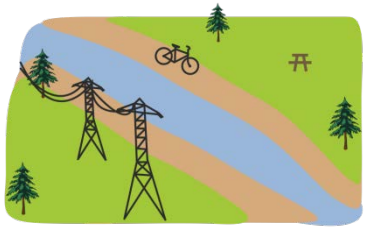
Hydropower

Navigation

Commercial fisheries



Other (e.g., social, secondary) effects



* Are primary benefits, historically used in B-C analysis

What are the net benefit methods?

- If all benefits and costs are monetized, standard B-C analysis
- If ecosystem restoration (ER) benefits are included:
  - ✓ cost effectiveness/incremental cost (CE/IC) analysis of ER outputs and potential tradeoff analysis is widely used
  - ✓ other methods can be used, including ecosystem services
- Multiple criteria analysis

EAP benefit and cost template

- EAP template to compare annual <u>monetized</u> benefits and costs:

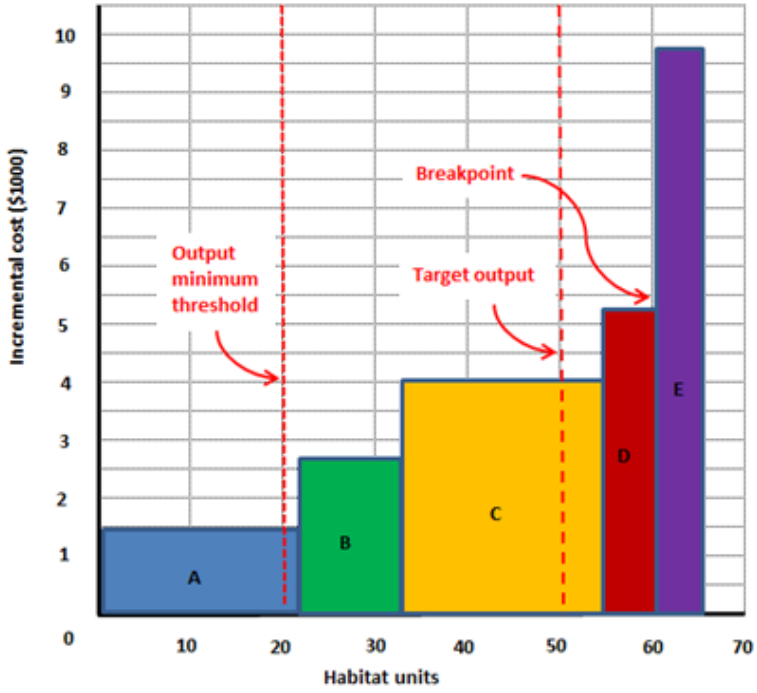
Benefits and costs (1)	Alternative plans A (2)	B (3)	C (4)	X (5)
Annual benefits				
(a) Flood risk management				
(b) Inundation				
(c) Intensification				
(d) Location				
(e) Total FRM benefits [(a)+(b)+(c)+(d)]				
(f) Water supply and quality				
(g) Recreation and open space				
(h) Hydropower				
(j) Navigation				
(j) Commercial fisheries				
(k) Other				
(l) Total annual benefits [(e)+(f)+(g)+(h)+(j)+(j)+(k)+(l)]				
Annual costs				
(m) Capital				
(n) OMPRR&R				
(o) Total annual costs [(m)+(n)]				
Annual net benefits [(l)-(o)]				
B/C ratio [(l)/(o)]				

Should DWR Monetize ER benefits?

Ecosystem restoration analysis

When NOT monetizing ecosystem restoration benefits:

- The cost effectiveness and incremental cost analysis (CE/IC) identifies the ER plan that delivers the most ER physical outputs at the least cost ("greatest bang for the buck")



“Combined plan” analysis

- If a project combines ER outputs with other monetized benefits (flood damage reduction, for example), the “combined plan” analysis is common:
  - ✓ Allocate total project capital and O&M costs to FDR and ER purposes
  - ✓ Monetized net benefits and B/C ratio are only estimated for FDR benefits and its allocated costs
  - ✓ Most cost-effective ER plan is determined with CE/IC analysis using ER allocated costs

Combining benefits example

- Example combined ER and FDR plan analysis--Hamilton City setback levee

Item (1)	FDR Allocated costs (2)	FDR Benefits (3)	Ecosystem Allocated costs (4)	Ecosystem Benefits (5)	Total costs and benefits Allocated costs (6)	Total costs and benefits Benefits (7)
Investment cost						
First cost[1]	$4,260		$40,446		$44,706	
Interest during construction	$271		$3,066		$3,337	
Total	$4,531		$43,512		$48,043	
Annual cost						
Interest and amortization	$272		$2,615		$2,887	
OMPRR&R	$47		$8		$55	
Subtotal	$319		$2,623		$2,942	
Annual benefits						
Monetary (FDR[2])		$577				$577
Non-monetary (Ecosystem)				888 AAHUs		888 AAHUs
Net annual FDR benefits		$258				258
FDR B/C ratio[2]		1.8				1.8

Multiple criteria analysis

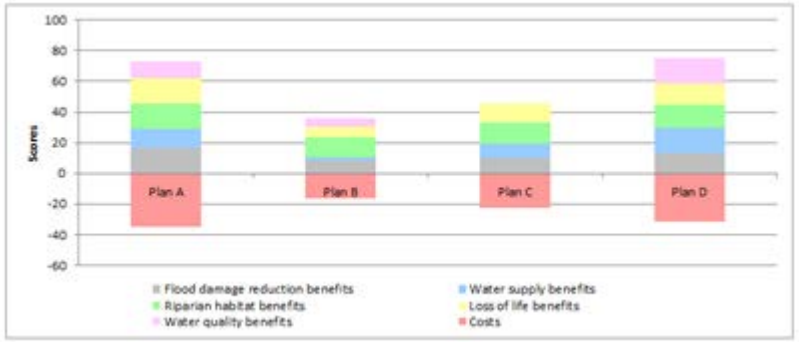
- Multiple criteria analysis (MCA) is a decision support tool that allows the evaluation of alternatives based on differently scaled criteria
- MCA:
  - Transforms criteria values expressed in different units into common numerical score
  - Allows weights to be assigned to these scores
  - Facilitates a systematic, transparent, and repeatable comparison of alternatives based on weighted scores
  - Does not replace B/C analysis, but can inform investment prioritization decisions

Multiple criteria analysis--example

Alternative plan	Criteria					
	Annual flood damage reduction benefits ($1000)	Annual water supply benefits ($1000)	Riparian habitat benefits (AAHUs)	Annual loss of life benefits (Persons)	Annual water quality benefits (Qualitative)	Annual costs ($1000)
Plan A	450	73	1,220	12	Medium	475
Plan B	220	12	980	5	Low	225
Plan C	258	60	1,000	9	None	300
Plan D	348	100	1,100	10	High	425

MCA transforms criteria values expressed in different units into normalized, weighted scores, that allow comparisons among plans

Alternative plan	Criteria						Total Weighted Score
	Annual flood damage reduction benefits	Annual water supply benefits	Riparian habitat benefits	Annual loss of life benefits	Annual water quality benefits	Annual costs	
Plan A	17	12	17	17	11	-35	38
Plan B	8	2	13	7	6	-17	19
Plan C	10	10	14	13	0	-22	23
Plan D	13	17	15	14	17	-31	44



Other programs employing these tools?

- Urban flood risk reduction (formerly EIP)
- Integrated water management grants
- Stormwater grants
- Local levee assistance
- Flood subventions
- Delta feasibility studies

FloodSAFE CALIFORNIA

Questions?